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VALUATION OF GRAZING RESOURCES IN ZIMBABWE'S COMMUNAL AREAS

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ABSTRACT

Svosve communal area has the highest mean maximum willingness to pay (MWTP) for grazing compared to the other three communal areas; Mhondoro-Ngezi, Chiduku and Buhera.

Households in natural region II have the highest mean MWTP for grazing compared to those households in natural regions III and IV.

Households under the traditional regime have the highest mean MWTP for grazing compared to those households under grazing scheme management and under the open access regime. Medium-rich households have the highest mean MWTP for grazing compared to poor and rich households. Defacto female-headed households have the highest mean MWTP for grazing compared to male headed and widow headed households. Households which do not own cattle have a higher mean MWTP for grazing than households which own cattle.

Chiduku communal area has the highest percentage of households willing to pay for grazing compared to the other three communal areas. Natural region II has the highest percentage of households willing to pay for grazing compared to natural regions III and IV. The open access regime has the highest percentage of households willing to pay for grazing compared to the traditional and grazing scheme regimes. Male headed households form the highest percentage of hoseholds willing to pay for grazing compared to defeacto female headed and widow headed households. Poor households form the highest percentage of households willing to pay for grazing compared to medium-rich and rich households. Households which do not own cattle are more willing to pay for grazing than those households which own cattle.

The probability that widow headed households are willing to pay for grazing is significantly higher than that of defacto female headed households. The probability of willing to pay for grazing is not significantly different between widow headed and male headed households.

Households in Svosve and Chiduku communal areas have a lower probability of willingness to pay for grazing than households in Buhera Communal area. The probability of willingness to pay for grazing is much lower for the households in Chiduku communal area. Households in Mhondoro-Ngezi have a higher probability of willingness to pay for grazing than households in Buhera.

Households in natural region II and natural region III have a significantly lower probability to pay for grazing than households in natural region IV. The probability that households under the traditional regime are willing to pay for grazing is significantly lower than that of households under the open access regime. The probability that households under grazing scheme management are willing to pay for grazing is significantly higher than that of households under the open access regime. Households which received $300 as the willingness to pay starting point are willing to pay less than those households which received $600 as the willingness to pay starting point.

INTRODUCTION

According to economic theory, if a good is provided at zero price, more of it is demanded than if there was a positive price. The greater level of demand becomes unrelated to the capacity of the relevant natural environments to meet the demand and this becomes a problem (Pearce et. al. 1989). Treating grazing resources as if they have a zero value is seriously risking overuse of these resources. Seeking monetary measure will to some extent, reflect the strength of feeling for the grazing resources.

Grazing resources are directly exploited through non-market, informal economic activity to support livestock, especially cattle, on which the livelihood of the communal area farmers is dependent.

This paper analyses households' willingness to pay for grazing. The contingent valuation methodology (CVM) was used to assess the households willingness to pay for grazing. A survey was conducted in four communal areas, Buhera, Chiduku, Mhondoro-Ngezi and Svosve. A total of 727 households were interviewed.

As a measure of households' perceptions of the importance of grazing, households were asked how much they were willing to pay for grazing given that only those who had paid up were the only ones who were allowed to graze. Households were asked how much they were willing to pay per animal per year.

For non-cattle owners it was assumed that they could estimate the importance of utilising grazing if they were to own cattle.

1.1 Applicability Of The Contingent Valuation Methodology

There is need to test for the applicability of the CVM in assessing the households willingness to pay for grazing. In order to test for the applicability of the CVM, tests for starting point bias were carried out. If households responses to the willingness to pay questions were random, there are no significant factors affecting households willingness to pay for grazing and hence the inapplicability of the CVM. If however the households took the willingness to pay questions seriously, willingness to pay for grazing is expected to be significantly affected by some of the household socio-economic characteristics and hence the applicability of the CVM to assess households' willingness to pay for grazing.

1.2 Starting Point bias

Starting point bias occurs when the initial bidding price affects the individual's final willingness to pay. A respondent may want to impress the interviewer interpreting the initial price as a clue to the "correct" bid.

To test for starting point bias, five starting point bids were used. The LSD test and the Duncan test were used

Table 4: MWTP by wealth

Wealth Status	Mean	Minimum	Maximum	Count
Rich	57.35	.00	800.00	96
Medium-rich	71.52	.00	1000.00	253
Poor	58.91	.00	1500.00	378

The medium-rich households have the highest mean MWTP for grazing of $71.52 followed by the poor households with a mean MWTP of $58.91. The wealthy households have the least mean MWTP for grazing of $57.35.

Table 5: MWTP by sex of head of household

Sex	Mean	Minimum	Maximum	Count
Male	59.21	.00	700.00	298
Defacto female	78.63	.00	1500.00	276
Widow	42.60	.00	600.00	153

Defacto female headed households have the highest mean MWTP for grazing of $78.63 followed by the male headed households with a mean MWTP for grazing $59.21. The widow headed households have the least mean MWTP for grazing of $42.60.

Table 6: MWTP by cattle ownership

Cattle Ownership	Mean	Minimum	maximum	Count
No cattle	67.82	.00	1500.00	337
Owns cattle	59.03	.00	1000.00	390

Households which do not own cattle have a higher mean MWTP of $67.82 compared to cattle owning households which have a mean MWTP for grazing of $59. 03.

From Table 8; 59.5% of the households in natural region II, 40.6% of the households in natural region III and 46.2% of the households in natural region IV are willing to pay for grazing. Of the three natural regions under consideration, natural region II is the only natural region whereby more than half the households are willing to pay for grazing. In the other natural regions, less than half of the households in the respective natural regions are willing to pay for grazing.

The percentages of households willing to pay for grazing by natural regions are; 37.6% for natural region II, 35.9% for natural region III and 26.4% for natural region IV. Natural region II has the highest percentage households willing to pay for grazing whilst natural region IV has the least percentage households willing to pay for grazing.

Table 9: Percentage households WTP by regime

Regime	**Not wtp**		**Wtp**	
	Col %	**Row %**	**Col %**	**Row%**
Traditional	21.6	68.3	10.9	31.7
Grazing scheme	47.8	87.4	7.5	12.6
Open access	30.6	29.0	81.6	71.0

Table 9 shows that 31.7% of households under the traditional regime, 12,6% of households under grazing scheme management and 71% of households under the open access regime are willing to pay for grazing. There are much more households under the open access regime which are willing to pay for grazing compared to those households under this same regime which are not willing to pay for grazing. There are very few households under grazing scheme management which are willing to pay for grazing compared to those households not willing to pay for grazing.

The percentages of households willing to pay for grazing by regime are; 10.9% for the traditional regime, 7.5% for grazing scheme management and 81.6% for open access. The open access regime therefore has the highest percentage households willing to pay for grazing, followed by those households under the traditional regime. Grazing scheme management has the least percentage of households willing to pay for grazing.

Table 10: Percentage households WTP by wealth

Wealth	**Not wtp**		**wtp**	
	Col %	**Row %**	**Col%**	**Row%**
Rich	13.5	53.1	12.9	46.9
Medium-rich	31.4	47.0	38.5	53.0
Poor	55.1	55.3	48.6	44.7

2. Explanatory variables for willingness to pay for grazing

The variables which are hypothesised to affect willingness to pay for grazing utilisation are given in table 13.

It is hypothesised that the more cattle a household has the higher the MWTP for grazing. The expected returns for keeping cattle increase as the cattle herd size increases, hence a higher WTP for grazing.

The sex of the household head is captured as a dummy variable. Male headed households are assigned the value 1, defacto female headed households are assigned the value 2 and widow headed households are assigned the value 3. Which head of household is most willing to pay for grazing cannot be determined *a priori*.

Table 13: Explanatory variables for willingness to pay for grazing.

Variable	**Description**	**measurement**
NoCat96	No. of cattle owned in 1996	No. of cattle
SexHHH	Sex of household head	1=male
Male		2=defacto female
Defacto female		3=widow
Widow		
HHHage	Age of household head	Age of household head
HHHedu	Education	1=did not attend school
Did not attend school	level of household head	2=primary education
Primary education		3=secondary education
Secondary education		
HHI	Gross household income from agricultural and non-agricultural sales	Total household income
WTPSTP	Willingness to pay starting point	1=wtpstp $50
wtpstp $50		2=wtpstp$75
wtpstp $75		3=wtpstp$150
wtpstp $150		4=wtpstp$300
wtpstp $300		5=wtpstp$600
wtpstp $600		
CA	Communal area	1=Svosve
Svosve		2=Mhondoro-Ngezi
Mhondoro-Ngezi		3=Chiduku
Chiduku		4=Buhera
Buhera		
NR	Natural region	2=NRII
NRII		3=NRIII
NRIII		4=NRIV
NRIV		
Regime	Agricultural regime	1=traditional regime
Traditional		2=grazing scheme
Grazing scheme		3=open access
Open access		

The effect of age of head of household on willingness to pay for grazing cannot be determined *a priori*. The

$$\left(\frac{Prob\ (event\ )}{Prob\ no\ event}\right) = e^{B_0 B_1 X_1 + \ldots B_p X_p} = e^{B_0} e^{B_1 X_1} \ldots e^{B_p X_p}$$

$$Prob\ (event) = \frac{e^z}{1+e^z}$$

Or equivalently

$$Prob\ (event\ ) = \frac{1}{1+e^{-z}}$$

where Z is the linear combination.

$$Z = B_0 + B_1 X_1 + B_2 X_2 + \ldots + B_p X_p$$

Where B are coefficients estimated from the data, X are independent variables.

The logistic model can be written in terms of the odds of an event occurring. The odds of an event occurring are defined as the ratio of the probability that it will occur to the probability that it will not.

$$\log\left(\frac{Prob\ (event\ )}{Prob\ (no\ event\ )}\right) = B_o B_1 X_1 + \ldots + B_p X_p$$

The logistic model written in terms of the log of the odds, is termed the logit and it is given below:
From the equation, the logistic coefficient can be interpreted as the change in the log odds associated with a one-unit change in the independent variable.

Then ***e*** raised to the power of ***b*** is the factor by which odds change when the ith independent variable increases by one unit. If B is positive, this factor will be greater than 1, which means that the odds are increased, if B is negative, the factor will be less than 1, which means that the odds are decreased. When B is 0, the factor equals 1, which leaves the odds unchanged.

2.2 Logistic results for willingness to pay for grazing

Three logistic models were run each with a different location variable. The three location variables; communal area, natural region and regime were introduced to the model one at a time. Tables 15 up to 17 show the results obtained after running the models. In all three models run, the number of cattle owned by a household, the age

Sex of head of household

The probability that widow headed households are willing to pay for grazing is significantly higher than that of *defacto* female headed households. The probability of willing to pay for grazing is not significantly different between widow and male headed households. *Defacto* female headed households are less willing to pay for grazing probably because they have other alternative sources of income.

The results obtained here are the same as those obtained when the model was run with natural region and regime as location variables as can be seen in tables 17b and 18b.

Location (communal area)

Households in Svosve and Chiduku communal areas have a lower probability of willingness to pay for grazing than households in Buhera. The probability of willingness to pay for grazing is much lower for the households in Chiduku. Households in Mhondoro-Ngezi have a higher probability of willingness to pay for grazing than households in Buhera.

Willingness to pay starting point

Households which received a starting point of $75 have a higher probability of willingness to pay for grazing than households which received a starting point of $600. Households which received a starting point of $300 have a lower probability of willingness to pay for grazing than households which received a starting point of $600. The probability of willingness to pay for grazing for households which received starting points, $50 and $150 is not significantly different from that of households which received a starting point of $600.

2.2.2. Willingness to pay for grazing by natural region

Table 15a: Classification table for willingness to pay for grazing by natural region

Observed		Predicted		Percent Correct
		0	1	
		0	1	
0	0	241	137	63.76%
1	1	97	251	72.13%
Overal				67.77%

From the table 241 households which were not willing to pay for grazing were correctly predicted by the model not to be willing to pay for grazing. Similarly 251 households willing to pay for grazing were correctly predicted by the model to be willing to pay for grazing. 234 households were mis-classified. Overall 66,77% of the

2.2.3. Willingness to pay for grazing by regime

Table 16a: Classification table for Willingness to pay for grazing by regime

Observed		Predicted		Percent Correct
		0	1	
		0	1	
0	0	270	108	71.43%
1	1	55	293	84.20%
Overall				77.55%

From the table, 270 households who were not willing to pay for grazing were correctly predicted by the model not to be willing to pay for grazing. Likewise, 293 households willing to pay for grazing were correctly predicted by the model to be willing to pay for grazing. 163 households were mis-classified. Overall 77,55% of the households were correctly classified. Thus the model for willingness to pay for grazing by regime fits the data very well.

Table 16b: Variables in the equation (by regime)

Variable	**B**	**S.E.**	**Sig**	**Exp(B)**
NoCat96	-.0175	.0209	.4035	1.0176
SexHHH			.1358	
Sexmale	-.1446	.2319	.5329	.8654
Sexdefacto female	-.5089	.2547	.0457	.6011
HHHage	.0059	.0072	..4113	.9941
HHHedu			.4740	
no education	-.2868	.2707	.2897	.7507
primary edu.	.1112	.3275	.7342	.8948
HHIncom	-4.3E-06	2.268E-05	.8509	1.0000
WTPSTP			.0000	
Wtpstp$50	.0147	.3283	.0029	1.0148
Wtpstp$75	.9800	.3288	.0752	2.6643
Wtpstp$150	.5806	.3264	.0232	1.7871
Wtpstp$300	.6711	.2956	.0002	.5112
Regime			.0000	
Traditional	-1.4717	.3292	.0000	.2295
Grazing Scheme	1.3591	.2812	.0000	3.8928
Constant	-.1297	.3836	.7354	
-2Log Likelihood	735.111			
Goodness of fit	698.087			
Model Chi-square	270.099		0.0000	

Location (regime)

The probability that households under the traditional regime are willing to pay for grazing is significantly less

The results show that widow headed households have a significantly higher probability of willingness to pay for grazing than defacto female headed households.

Households in Svosve and Chiduku communal areas have significantly lower probabilities to pay for grazing than households in Buhera. Households in natural region II and natural region III have a significantly lower probability to pay for grazing than households in natural region IV. Households under the traditional regime have a significantly lower probability of willingness to pay for grazing than households under the open access regime. Households under grazing scheme management have a probability of willingness to pay for grazing which is significantly higher than that of households under the open access regime.

When the location variable is communal area, results show that the probability of willingness to pay for grazing for households which received willingness to pay starting point bids of $50 and $150 is not significantly different from households which received willingness to pay starting point bid of $600. When the location variable is natural region, the probability of willingness to pay for grazing for households which received willingness to pay starting point bid of $50, $75 and $150 is not significantly different from households which received starting point bid of $600. Finally when the location variable is regime, the probability of willingness to pay for grazing for households which received willingness to pay starting point bid of $50 is not significantly different from households which received willingness to pay starting point bid of $600.

REFERENCE

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